SHORT QUESTIONS

Q.1- Define frequency of a value in a data.

Ans. If a values "x" Occurs "n" times in a data then n is called frequency of x.

If there are "f" number of values between x_1 to x_2 then "f" is called frequency of interval $x_1 - x_2$.

Q.2- Define "Histogram".

Ans. When a bar chat for a given data is constructed so that the area of each bar is propositional to the frequency of corresponding group. This chart is called histogram.

Q.3- How is a frequency polygon constructed?

Ans. It is a many sided closed figure. It is constructed by plotting frequencies against the class marks and then joining the points by straight lines.

A frequency polygon can also be obtained by joining the mid points of the tops of all the rectangles in the histogram.

Q.4- Define the term "Ogive".

Ans. When the cumulative frequencies are plotted against the end points of their respective class intervals and joining the points together, the resulting graph is called cumulative frequency Polygon or Ogive.

Q.5- Define "Arithematic Mean" of *n* values of ungrouped data.

Ans. The Arithmetic mean of n values $x_1, x_2, x_3 ... x_n$ is defined as:

$$A.M = \bar{x} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

Q.6- Define "Medain" of n valued ungrouped data.

Ans. The medain of an ungrouped data is the middle value of the set of values in the data when the data is arranged in numerical order.

To find the medain of a given data, following steps are taken.

1- Arrange the data in numerical order.

2- In case of odd number of terms the middle term is median.

3- In case, these are even number of terms the average of the two middle terms is taken a median.

Q.7- Define "Mode of a data".

Ans. The mode is the "value" which occurs greatest times in the set of data. For example consider the data *3,2,4,5,4,6,4,8.*

In this data *4* occurs thrice. So *4* is the mode.

Q.8- Define "Geometric Mean".

Ans. The geometric mean *"G"* of *n* positive values $x_1, x_2, x_3 ... x_n$ is the nth root of the product of the values. Thus.

$$G = \sqrt[n]{x_1.x_2.x_3...x_n}$$

$$= (x_1 \times x_2 \times x_3 \times ... \times x_n)^{\frac{1}{n}}$$

For example.

G.M of *2,4,8* is

G.M $= \sqrt[3]{2 \times 4 \times 8} = 64^{\frac{1}{3}}$

G.M $= 4$

Q.9- Define "Range" of a data.

Ans. Range is the simplest measure of dispersion. Range of a data is the difference between the largest and the smallest value in the data.

So,

Range = (largest value) − (smallest value)

$R = x_m - x_a$

Q.10- Consider the data 6,2,5,3,4,5,4,5,1. Find the mean, Median and Mode.

Solution.

The arranged data is

$1,2,3,4,4,5,5,5,6$

There are nine term and the middle term is 4. Thus

Median = 4.

5 occurs the greatest number of times

So Mode = 5

$$\text{Mean} = \frac{1+2+3+4+4+5+5+5+6}{9}$$

$$= \frac{35}{9} = 3.89$$

SOLVED EXERCISES

EXERCISE 10.1

Q.1- **Fifty Junior school children joined the school's computer club. Their ages were recorded.**

10	8	9	10	7	8	8	11	10	9
7	8	9	9	10	11	11	10	9	8
8	7	9	7	10	7	10	8	9	11
10	11	8	10	9	8	9	7	11	10
9	10	10	11	10	11	7	11	10	9

Make a frequency table showing the number of each age and illustrate this information with a bar chart.

Solution. Frequency Table

Age	Tally marks	Frequency
7	卌 ||	7
8	卌 ||||	9
9	卌 卌 |	11
10	卌 卌 ||||	14
11	卌 ||||	9

Q.2- **The local fish and chip shop had 56 customers on Saturday evening. They spent the following amount in rupees.**

270	110	45	96	250	490	325	45
382	136	125	450	420	380	150	250
85	250	320	525	218	210	216	120
155	430	250	40	510	150	510	245
320	120	316	150	260	45	180	310
273	280	85	280	318	45	210	282
462	316	218	316	325	45	560	315

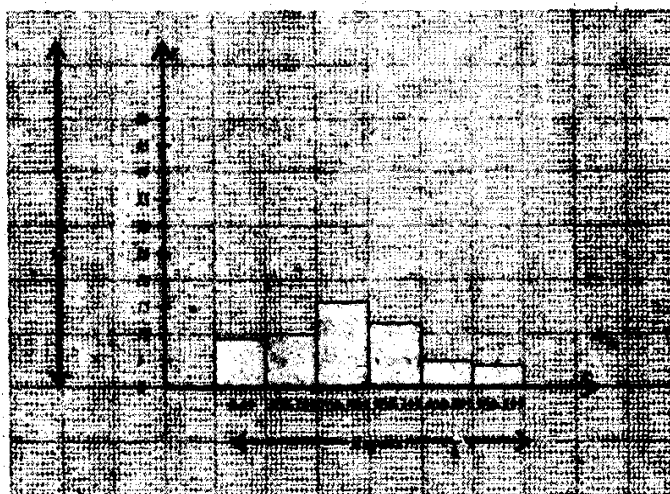
use groups Rs.0-99, Rs.100-199, Rs.200-299, Rs.300-399, Rs.400-499, Rs.500-599 to make a frequency table illustrate the data with a bar chart.

Solution.

Frequency Table

Class intervals	Tally Marks	Frequency
Rs 0---99	~~IIII~~ IIII	*9*
Rs 100---199	~~IIII~~ ~~IIII~~	*10*
Rs 200---299	~~IIII~~ ~~IIII~~ ~~IIII~~ I	*16*
Rs 300---399	~~IIII~~ ~~IIII~~ II	*12*
Rs 400---499	~~IIII~~	*5*
Rs 500---599	IIII	*4*

For bar chart

Class intervals	Class Boundaries	Frequency
0---99	*0---99.5*	*9*
100---199	*99.5---199.5*	*10*
200---299	*199.5---299.5*	*16*
300---399	*299.5---399.5*	*12*
400---499	*399.5---499.5*	*5*
500---599	*499.5---599.5*	*4*

Q.3- **The weights to the nearest gram of 30 bags of popcorn sold at a festival are given as:**

69	83	75	65	68	68	73	70	80	79
70	76	63	86	69	65	66	74	86	68
70	60	67	74	65	65	67	88	81	63

Make a frequency table, Illustrate the data with a bar chart.

Solution.

Frequency Table

Class Interval	Class Boundaries	Tally Marks	Frequency
60---64	*59.5---64.5*	|||	*3*
65---69	*64.5---69.5*	~~||||~~ ~~||||~~ ||	*12*
70---74	*69.5---74.5*	~~||||~~ |	*6*
75---79	*74.5---79.5*	|||	*3*
80---84	*79.5---84.5*	|||	*3*
85---89	*84.5---89.5*	|||	*3*

Make Bar-Chart

EXERCISE 10.2

Q.1- **Draw a histogram to represent the frequency table in each of the following tables.**

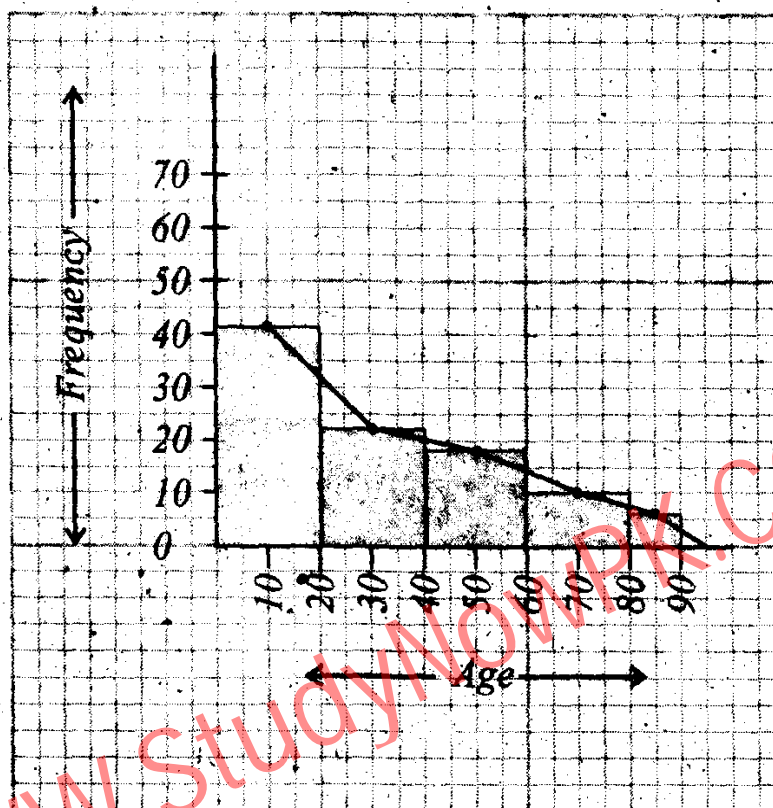
(i) The table shows the distribution of ages of 100 people attending a school function.

Age (Years)	0-19	20-39	40-59	60-79	80-89
Frequency	43	24	17	10	6

Solution.

The given table with class boundaries is

Age(Year)	Class boundaries	Frequency
0---19	*0---20*	*43*
20---39	*20---40*	*24*

40---59	40---60	17
60---79	60---80	10
80---89	80---90	6

(ii) The table shows the results of a survey on the weekly earnings of *100* sixteen-year old boys.

Weekly earnings	0-9	10-19	20-29	30-39	40-49	50-59
Frequency	45	10	11	21	10	3

Solution. The given table with class boundaries is

Class intervals	Class boundaries	Frequency
0-9	0-10	45
10-19	10-20	10
20-29	20-30	11
30-39	30-40	21
40-49	40-50	10
50-59	50-60	03

Make Histogram

(iii) The table shows the distribution of the average marks of *40* children in the end-of-year examinations.

Average	*1-20*	*21-40*	*41-60*	*61-80*	*81-100*
Frequency	*2*	*4*	*19*	*12*	*3*

Ans. The given table with class boundaries is

Class intervals	Class boundaries	Frequency
1-20	*0.5-20.5*	*2*
21-40	*20.5-40.5*	*4*
41-60	*40.5-60.5*	*19*
61-80	*60.5-80.5*	*12*
81-100	*80.5-100.5*	*3*

Make Histogram

Q.2- Following histogram shows the distribution of the times taken by 50 children to go to school. Construct a frequency table from the histogram.

Solution. Frequency table

Class Intervals	Frequency
1---10	*5*
11---20	*15*
21---30	*13*
31---40	*5*
41---60	*5*

Q.3- Following histogram is based on the number of hours that 30 children spent watching television on a particular Saturday. Construct a frequency table from the histogram.

Ans. Frequency Table

0-1	*1-2*	*2-3*	*3-4*	*4-5*
2	*12*	*8*	*6*	*3*

EXERCISE 10.3

Q.1- Represent the given data using Frequency polygon.

(i) The table shows the distribution of marks of 30 children in a test.

Marks	0-39	40-49	60-79	80-99
Frequency	8	8	10	4

Solution. The given table is

Marks	Mid-points	Frequency
0-39	19.5	8
40-49	44.5	8
50-59	54.5	0
60-79	69.5	10
80-99	89.5	4

Histogram and Frequency Polygon

(ii) The table shows the distribution of length (to the nearest 10mm) of 50 blades of grass.

Time (second)	1-40	41-50	51-60	61-70
Frequency	8	15	7	10

Solution.

Time	Class boundary	Frequency
1-40	0.5-40.5	8
41-50	40.5-50.5	15
51-60	505-60.5	7
61-70	60.5-70.5	10

(iii) The table shows the distribution of weights of 30 bags of chips from a fish and chip shop.

Weight(grams)	1-50	51-60	61-70	71-80
Frequency	4	8	14	4

Solution.

Weight	Class boundaries	Frequency
1-50	0.5-50.5	4
51-60	50.5-60.5	8
61-70	60.5-70.5	14
71-80	70.5-80.50	4

(iv) The table gives the distribution of marks of 100 students in an end of-terms mathematics examination.

Marks	0-29	30-39	40-49	50-59	60-69
Frequency	10	15	25	34	16

Ans.

Marks	Class boundaries	Frequency
0-29	0-30	10
30-39	30-40	15
40-49	40-50	25
50-59	50-60	34
60-99	60-100	16

EXERCISE 10.4

Q.1- Construct a cumulative frequency polygon (that is, an ogive) for the given data.

(i) The table shows the distribution of weights (in kilograms) of 60 boys of ten years of age.

Weight (kg)	31-36	37-39	40-42	43-45	46-54
Frequency	8	10	18	12	12

Solution.

Class Intervals	Class boundaries	f	$c.f$
31-36	30.5-36.5	8	8
37-39	36.5-39.5	10	18

40-42	39.5-42.5	18	36
43-45	42.5-45.5	12	48
46-54	45.5-54.5	12	60

Make Ogive

(ii) The table shows the distribution of times taken (in minutes) for 50 children of five years age to eat their school dinners.

Time(minutes)	4-5	6-7	8-9	10-11	12-15	16-19	20-29
Frequency	5	4	10	9	6	6	10

Ans.

Class Intervals	Class boundaries	f	c.f
4-5	3.5-5.5	5	5
6-7	5.5-7.5	4	9
8-9	7.5-9.5	10	19
10-11	9.5-11.5	9	28
12-15	11.5-15.5	6	34
16-19	15.5-19.5	6	40
20-29	19.5-29.5	10	50

Make Ogive

Solution.

Class Intervals	Class boundaries	f	c.f
0-9	0-10	10	10
10-19	10-20	20	30
20-29	20-30	30	60
30-39	30-40	20	80
40-69	40-70	15	95

Make Ogive

(iv)

Classes	5-10	10-15	15-20	20-25	25-30
Frequency	10	15	20	30	15

Solution.

Class boundaries	f	$c.f$
5-10	10	10
10-15	15	25
15-20	20	45
20-25	30	75
25-30	15	90

Make Ogive

(v) The table gives the distribution of weights (kilograms) of 100 people.

Weight(kilogram)	50-59	60-69	70-79	80-89	90-99	100-109
Frequency	15	30	35	15	3	2

Solution.

Class Intervals	Class Boundaries	f	$c.f$
50-59	49.5-59.5	15	15
60-69	59.5-69.5	30	45
70-79	69.5-79.5	35	80
80-89	79.5-89.5	15	95
90-99	89.5-99.5	3	98
100-109	99.5-109.5	2	100

Make Ogive

Review Exercise 10

Q.1- Encircle the correct answer.

(i) When a bar graph is constructed, so that the area of each bar is proportional to the number of items in each group is called.

(a) curve *(b)* ogive
(c) histogram *(d)* bar diagram

(ii) The summary statistics which measure the middle (or center) of the data is called:

(a) mean *(b)* mode
(c) median *(d)* all of these

(iii) If all numbers in a set are added together and then the total is divided by the number of scores in the set is called

(a) mean *(b)* mode
(c) median *(d)* weighted mean

(iv) The middle values of the data arranged in numerical order is called

(a) mode *(b)* median
(c) mean *(d)* geometric mean

(v) The score which occurs most often in a set of data is called

(a) mode *(b)* mean
(c) median *(d)* geometric mean

(vi) $\bar{X} = \dfrac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

(a) means value of $x_1, x_2, \ldots, x_n$ *(b)* arithmetic mean
(c) geometric mean *(d)* weighted mean

(vii) $H = \dfrac{n}{\sum\left(\dfrac{1}{x}\right)}$ is called.

(a) harmonic mean (b) mode
(c) mean (d) arithmetic mean

(viii) $\overline{X}_w = \dfrac{\sum wx}{\sum w}$

(a) arithmetic mean (b) weighted mean
(c) geometric mean (d) mean

(ix) $\sum(x_i - \overline{X}) = 0$ is one of the properties of

(a) arithmetic mean (b) geometric mean
(c) harmonic mean (d) mode

Ans:

(i) c	(ii) d	(iii) a	(iv) b
(v) a	(vi) b	(vii) a	(viii) b
(ix) a			

Q.2- Fill in the blanks.

(i) When a bar graph is constructed, so that the area of each bar is proportion to the number of items in each group is called a_____

(ii) The summary statistic which measure the middle (or center) for the data is called_____

(iii) If all numbers in a set are added together and then the total is divided by the number of scores in the set is called_____

(iv) The middle value of data arranged in numerical order is called_____

(v) The score which occurs most often in a set of data is

called_____

(vi) $\overline{X} = \dfrac{x_1 + x_2 + x_3 + \cdots + x_n}{n}$ is called the_____

(vii) The nth root of the product of the values of a set of n positive values is called_____

(viii) $H = \dfrac{n}{\sum\left(\dfrac{1}{x}\right)}$ is called the_____

(ix) $\overline{X}_w = \dfrac{\sum wx}{\sum w}$ is called the_____

(x) $\sum(x_i - \overline{X}) = 0$ is one of the properties of_____

Ans:

(i) Histogram	(ii) Mean Median or made	(iii) Arithmetic mean	(iv) Median
(v) Mode	(vi) Arithmetic Mean	(vii) Geometric Mean	(viii) Harmonic Mean
(ix) Weighted Mean	(x) Arithmetic Mean		

Q.3- Find the standard deviation of the values 2, 3, 6, 8, 11.

Solution:

$$\bar{x} = \frac{2+3+6+8+11}{5} = \frac{30}{5} = 6$$

Now

$$S.D = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

$$= \sqrt{\frac{(2-6)^2+(3-6)^2+(6-6)^2+(8-6)^2+(11-6)^2}{5}}$$

$$S.D = \sqrt{\frac{16+9+0+4+25}{5}} = \sqrt{\frac{54}{5}}$$

$$= \sqrt{10.8} = 3.29 \text{ Ans.}$$

Q.4- Find the standard deviation and variation for a set of ungrouped values, when $n = 15,\ \sum x = 48, \bar{x} = 10$.

Ans. Solution:

Q.5- For the data 3, 5, 6, 8, 8, 9, 10 , find

(i) Mean *(ii)* Median *(iii)* Mode

Solution:

$$\text{Mean} = \frac{\sum x}{n} = \frac{3+5+6+8+8+9+10}{7}$$

$$\text{Mean} = \frac{49}{7} = 7$$

To find the median the arranged data is

$$\underbrace{3, 5, 6,}\ 8,\ \underbrace{8, 9, 10}$$

The Middle term is 8. So

Median $= 8$

To find the mode, we see 8 is repeated two times in the data.

So Mode $= 8$

Q.6 Find the mean, median and mode for the set of the value 4, 6, 7, 4, 8, 9, ,7, 10.

Ans. Solution:

$$\bar{x} = \frac{\sum x}{n}$$

$$\text{Mean} = \bar{x} = \frac{4+6+7+4+8+9+7+10}{8}$$

$$= \frac{55}{8} = 6.875$$

To find the median, the arranged data is

$$\underbrace{4, 4, 6,} 7, 7, \underbrace{8, 9, 10}.$$

There are eight terms, so median is the mean of the middle two terms 7 and 7. So

$$\text{Median} = \frac{7+7}{2} = \frac{14}{2} = 7$$

To find mode, we see 4 and 7 both appears twice in the data. So 4 and 7 both are Modes of the given data.

MULTIPLE CHOICE QUESTIONS

Q.1- In histogram each bar represent the frequency by its

(a) Height (b) Length (c) Width (d) Area

Q.2- A frequency polygon can also be obtained by joining the ___ of the top of the rectangles in the histogram.

(a) Last points (b) Initial points
(c) Mid-points (d) End-points

Q.3- Cumulative frequency of the last class interval is equal to

(a) $\sum x$ (b) $\sum f$ (c) $\sum fx$ (d) $\frac{\sum x}{n}$

Q.4- Ogive is also called.

(a) Frequency Polygon
(b) Cumulative frequency Polygon
(c) Histogram (d) Bar chart.

Q.5- The middle term of an ordered data is

(a) Mean (b) Median
(c) Mode (d) Range

Q.6- The most frequent observation in a data set is called.

(a) Mean (b) Median

(c) Mode (d) Range

Q.7- Arithmetic Mean is equal to

(a) $\frac{\sum x}{n}$ (b) $\frac{\sum fx}{\sum f}$

(c) $A+\frac{\sum fd}{\sum f}$ (d) All of these

Q.8- The $\frac{n+1}{2}$ th term of numerically Ordered data is called.

(a) Mean (b) Median

(c) Mode (d) Range

Q.9- Median of a data can be estimated from the graph of

(a) Histogram (b) Frequency Polygon

(c) Ogive (d) Bar Chart

Q.10- A given data can have more then one value of

(a) Mean (b) Median

(c) Mode (d) Range

Q.11 There may be a data that have no value of

(a) Mean (b) Median

(c) Mode (d) S.D

Q.12- Which of the four valued data has same values of Mean, Median and Mode.

(a) $1,2,4,8$ (b) $-4,0,4,0$

(c) $2,4,8,16$ (d) $3,0-3,1$

Q.13- Harmonic Mean of 3,4,8 is

(a) 1.23 (b) 2.23

(c) 3.23 (d) 4.23

Q.14- Second quartile of the data is equal to

(a) Mean (b) Median (c) Mode (d) S.D

Q.15- The difference of the largest value and the smallest value of data is called.

(a) Deviation (b) Range (c) S.D (d) Variance

Q.16- The square of standard deviation is called

(a) Variance (b) Dispersion
(c) Range (d) Mean

MODEL CLASS TEST

Time : 40 mins Max Marks : 25

Q.1- Tich the best choice.

(i) Mode of the data 2,5,7,3,6 is

(a) Mode does not exist (b) 5 (c) 6 (d) 5.3

(ii) The middle value of data arranged in numerical order is called

(a) Mode (b) Median
(c) Mean (d) Geometric Mean

(iii) $\frac{\sum wx}{\sum w} = ?$

(a) Arithmetic Mean (b) Weighted Mean
(c) Geometric Mean (d) Harmonic Mean

(iv) $\frac{n}{\sum \frac{1}{x}}$ is called

(a) Harmonic Mean (b) Median
(c) Mode (d) Mean

(v) Geometric Mean of 2,4,8 is

(a) 3 (b) 4
(c) 5 (d) 6

(vi) A data has 10 terms whose arithmetic mean is 165. The sum of all the terms is

(a) 16.5 (b) 175 (c) 1650 (d) 155

(vii) 3 is the ___ of the data $2,3,6$

(a) A.M (b) H.M (c) G.M (d) Mode.

Q.2- Attempt any five of the following short questions.

(i) Define arithmetic mean of data $x_1, x_2, x_3, \ldots x_n$

(ii) Find A.M, Median and Mode of $4,10,7,7,9,5$

(iii) Find Standard Deviation of $4,6,11$

(iv) Consider the data $184,191,172,193,195$ and take assumed mean $A = 180$, Find arithmetic mean.

(v) Mode of a data does not exist. Explain this statement.

(vi) Geometric Mean of a data is Zero. What is meant by this statement.

(vii) Find range of data "$2,5,3,8,6,9,15,1,20$" Attempt any two of the following long questions.

Q.3- Construct cumulative frequency polygon.

Classes	5-10	10-15	15-20	20-25	25-30
Frequency	10	15	20	30	15

Q.4- Draw the histogram

Marks	1-20	21-40	41-60	61-80	81-100
Frequency	2	4	19	12	3

Q.5- Find the arithmetic, geometric and harmonic means of 3,4,8.